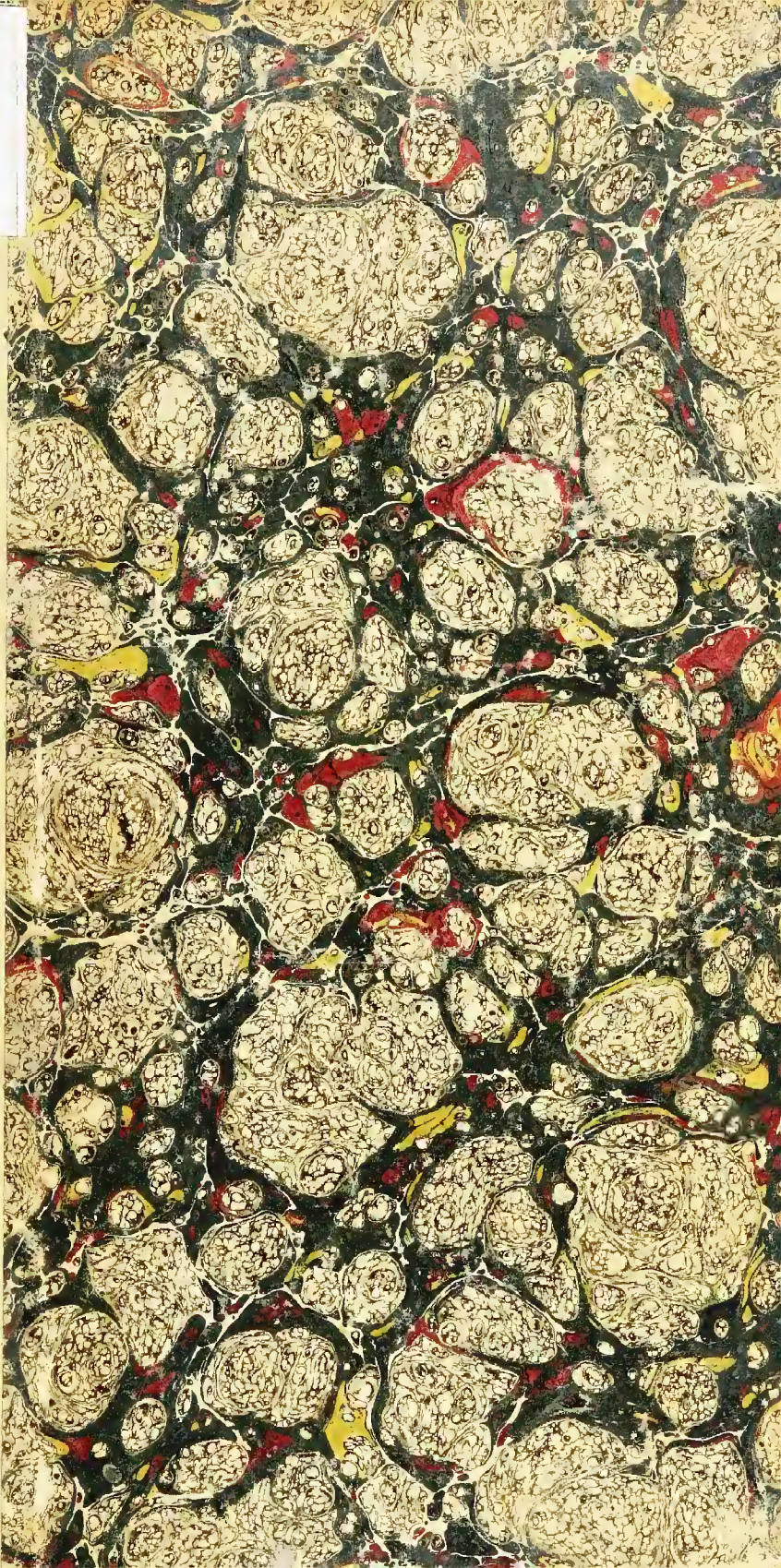
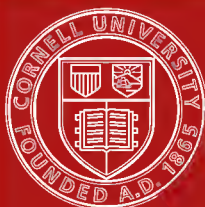


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CONSCIOUS ATTITUDES

BY

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The term *Bewusstseinslage*, in the sense of 'conscious attitude,' was introduced into experimental psychology, at Marbe's suggestion (1901), by Mayer and Orth, who employed it to characterise certain conscious phenomena, describable neither as determinate ideas nor as volitions, which appeared in the course of a qualitative study of association. These phenomena are referred to by Marbe himself (1901) as "obvious facts of consciousness, whose contents, nevertheless, either do not permit at all of a detailed characterisation, or at any rate are difficult to characterise;" instances are doubt, difficulty, effort, assent, conviction. Marbe offers, then, no definition of the conscious attitude; he gives only a negative criterion and a list of examples. Messer (1906) adds to the list, and at the same time extends the range of the term, using it to include experiences of logical relation, of the meaning of words and sentences, etc. Bühler (1907) restricts the attitudes to the "mehr zuständlichen Erlebnisstrecken, die als Zweifeln, Besinnen, Abwarten, Erstaunen, usw. beschrieben werden." Marbe seems not to approve of the restriction: "die neuerdings versuchte Einschränkung des Begriffes der Bewusstseinslage entspricht nicht den Ausführungen Marbes," declares

¹From the Psychological Laboratory of Cornell University.

a recent writer from the Würzburg laboratory; and the implication is that Marbe holds to his original ideas.¹

It is clear that to attempt a definition of 'conscious attitude' at the present time, would be premature. We use the phrase to denote certain large and comprehensive experiences, not evidently imaginal in character; and it is our aim, in this study, to bring these experiences to the test of introspective observation, and thus to discover whether or not they are analysable. Whatever be the outcome of the discussion of 'imageless thought,' it is probable that the name 'conscious attitude' will be retained as a descriptive term; but how the attitudes are to be distinguished, analytically, from 'thoughts' on the one hand, and 'emotions' on the other, must be left for the future to decide.

INCIDENTAL ANALYSES

The conscious attitude is, in general, an elusive experience, which it is difficult to secure in isolation; we therefore resorted in the main to an indirect method, and sought to arouse conscious situations in which various attitudes would be likely to occur. The observers were instructed to give complete introspections. The stimuli in the first series of experiments were letters or words which were written in the blind point-alphabet, and were perceived tactually. At the first sitting the observer was given a slip bearing several letters in their alphabetical order, and was allowed to feel them, and to associate the name to the tactual perception in any way that he chose. Then letters or words were given him to be recognised. The experiments by this method fall into two periods. Those performed during the spring term of 1909 were tentative, and their results were used for the improvement of the method. The stimuli for single experiments were short words or nonsense-combinations of letters. The introspections were written by the observers.

When the work was taken up again in October, the method was somewhat modified. Only single letters, the first ten of the alphabet, were used as stimuli. The whole of a word, perceived tactually, cannot be 'taken in at a glance' as in visual perception. If the letters were mere nonsense-combinations, each letter had to be recognised separately; the experiences thus became complex, and the introspective report might be incomplete. If the letters made a word, the observer tended to interpret from context, which further complicated the problem. In the new series, the reports were dictated, and writ-

¹On conscious attitudes in general, see E. B. Titchener, *Exp. Psychol. of the Thought-processes*, 1909, 98 ff., 270, etc.; E. von Aster, *Zeits. f. Psychol.*, xlix., 1908, 60 ff.; on Marbe's position, M. Beer, *ibid.*, lvi., 1910, 265.

ten down by the experimenter. The most important change in method, however, was the measurement of the reaction-time. The instrument used was a Vernier chronoscope, one key of which had been replaced by a lever arranged just above the letter to be felt. When the observer touched the letter he moved the lever, and thus broke a current and released the pendulum. A finger of the left hand rested throughout on the other reaction key; as soon as the observer recognised the letter, he pressed this key, and released the other pendulum. In these, as in the earlier experiments, the observer was given the letters, in alphabetical order, to feel at the beginning of every hour, unless he declared, of his own accord, that the letters were clear in memory. There was constant instruction to reduce all experience to its lowest terms.

The observers were Dr. Pyle (P), Dr. Okabe (O), Mr. Foster (F), and Miss de Vries (V). The first was at the time assistant in psychology, and the other three were graduate students of considerable experience in introspection. When the experiments were given in their changed form, Dr. Geissler (G), instructor in psychology, took the place of Dr. Pyle. Miss Mary Clarke (MC) and the writer (HC) were observers in some later experiments. MC was untrained in psychology, though advanced in other lines.

1. Types of Observers

P is predominantly verbal in type. He reports verbal ideas in sentence form, with a few visual images, sensations of strain, organic sensations and feelings. Thus, CAB. cab. "I perceived the first letter and said C, but had verbal ideas like 'I am not sure whether it is or not.'"

V represents a mixed type. Visual images play a large part in her consciousness, and many of these are colored. Recognition is often mediated by a tactual image on the finger. Verbal ideas, affective processes, kinæsthetic and organic sensations are also numerous. Thus, DC. dc. "Felt the dots and said d, c. Unpleasant. Got visual image at once from the feel, and then said the letter." E. e, 1. 20. "Very pleasant. Sensations from mouth in smiling. The dot fitted into a hole in my finger which corresponded to E. Reaction automatic and hardly conscious. I visualised the round dot and a printed E. Smiled at the similarity of these."

O is also of a mixed type, reporting visual, verbal and auditory images in great numbers. Organic sensations and strain play a great part in his consciousness, as do also affective processes, kinæsthetic and tactual images, pain and temperature sensations. Thus, I. i, 5.12. "Attention well concentra-

ted and body well adjusted. When I touched the lever, shock from muscular contraction. Vacant consciousness, state of waiting. Organic sensation like irritation in back. Stamping of foot, frowning, extreme unpleasantness. Feeling of motion on left finger; probably a real motion, not an image. Suddenly a visual-verbal image I."

F reports verbal, visual and auditory images; more auditory than any other observer except O. Kinæsthetic images and organic and strain sensations are also reported, as well as a few affective processes. Thus, IF. if. "The two letters have different organic sensations. I cannot describe them except by saying that that which is with I is long, and that which is with F is broad; both are narrow, like the letters themselves."

In the introspections of G, all imagery except verbal is almost entirely lacking. Sensations, both kinæsthetic and organic, and affective processes are prominent in consciousness. When G felt the alphabet in order to learn the letters, he described every letter aloud, and associated the verbal description with the tactual perception. G reports that his consciousness in general is almost without images, and his memory of scenes and events is in verbal form. He places things spatially by means of eye-movements, which are unaccompanied by images. Thus, B. b, 4.42. "At the first touch perception of a long row of dots with absolute clearness. It confused me, that is, it excited a complex of organic sensations, and the verbal idea, Why can't I tell what it is? Organic sensations especially from diaphragm. I said, I have to see whether there is a dot below or a changed dot at the end. Then another careful touch of the letter, with the little dot below most prominent. Verbal ideas: Oh, yes, that is B. The whole strongly pleasant."

MC is of a pronounced visual type, but reports some imagery from other senses.¹ Thus, *Symposium*. "Verbal image of the word with sensations in throat. Visual image of a picture of a Greek symposium from a Greek history, followed by image of a table with people seated around it. Image of a convention and auditory image, Round table."

HC is of the same type of imagery as MC. Thus, *Reliability*. "Visual and verbal images of the word. Very vague visual image of some kind of support bearing a heavy weight."

2. Attitudes Analysed

In going over the introspections, to discover what attitudes have been analysed by the observers, we meet with some am-

¹For the method employed with MC and HC, see p. 236 below.

biguity and confusion of terms. So far as attitudes have been named, they have been listed under the name applied by the observer. With this word of caution we proceed to consider the analyses of various attitudes to be found in the reports.

APPROVAL. V. Pleasantness, with some general kinæsthesia.

AWFULNESS. G. Once analysed as a strong unpleasantness and frowning, and again as the same with the addition of inhibition of breathing.

BAFFLED EXPECTATION. O. Visual image of face and frowning forehead. Left foot stamped. Slight burning sensation in back. Bodily and mental attitude was adjusted to a more difficult letter. Partial relaxation and muscular strain in upper part of body. Organic sensation and muscular strain which I could not localise.

CAUTION. V. Verbal idea, Be careful.

COMFORT. V. Organic sensation and smiling.

COMPARISON. HC. The two things were side by side, visually.

CONFIDENCE. O. A good adjustment of muscles, and sensations from them. Agreeable organic sensations. V. "I sat up straight and took deep breaths, and had a sense of stiffness in the spine, and pleasantness."

CONFUSION is analysed by G as "a complex of organic sensations, and verbal idea, Why can't I tell what it is?" "Unpleasantness, organic attitude of inhibited movement of diaphragm and of breathing." F analyses it once as a number of conflicting strains.

O reports the repeated appearance of conflicting verbal ideas: "It may mean B and it may mean C," unpleasantness, and organic sensations in abdomen which seemed to travel upward and to be checked by some obstacle. "Several initial associations of auditory-kinæsthetic images. Muscular strain in head, organic sensation in trunk." V reports holding of breath and blank consciousness.

CONSCIOUSNESS OF FITNESS. O. Relaxation of organic and muscular strain, stretching of back, long breathing.

CONSCIOUSNESS THAT THE LETTER WAS TOO SMALL. O. Muscular strain and organic sensations.

DECISION. O. Slightly agreeable feeling and successive auditory images, It must be so.—Auditory image. Kinæsthetic bodily attitude. Organic sensations.—Bodily attitude and relaxation of muscular strain.—Memory image, visual or tactual or both, of E. Change of organic and muscular sensations. (This attitude is analysed several times by the same observer in the same way.)

DECISION TO DISREGARD THE LEVER. F. Visual and kinæsthetic images of this action. I saw myself doing it.

DETERMINATION. G. Pleasant mood. Verbal idea, I am going to do that well. F. Nodding of head toward finger, and attending to tactual image of coming sensation. V. Verbal ideas, biting the teeth and jerking the head.

DIFFICULTY. G. Trouble to get a verbal idea. Three ideas a, e, and i were ready, but I do not know how.

DISAPPOINTMENT. V. Organic and verbal. I said Oh. My muscles had been strained, but were now relaxed all over. Sensation from frowning. Very unpleasant.

DISGUST. O. Organic sensations throughout the body. Unpleasantness.

DISSATISFACTION. O. Reported twice. Once not analysed. Once reported as consisting of muscular strain, organic sensations, and unpleasantness.

DISTANCE AND DIRECTION. MC. In almost every experiment this observer reports a sense of distance and direction towards a place that is thought of. The two usually occur together, though sometimes the one is reported alone. "Direction goes on in front of my head, and it feels as

if something inside of my head were moving in the given direction. I think this is an image, not a real movement." "Distance is a visual image of the space, boiled down, which lies between the two places. It is a schematic visual image." In one case, in which the observer had been thinking of, picturing, scenes in the east, these were replaced by images of places in her home town, and she says: "In going from one to the other my mind distinctly moved west. This movement is located in the top of the head, and seems like a movement of something inside of the head." In some cases MC says her mind 'flew' to a certain place, and this experience seems to have been a seen motion across a visual area with some kinæsthesia.

EASE OF RECOGNITION. G. Localised once in the trunk, and again as vaguely organic.

EASINESS. (This is partially analysed by O fifteen times, and is mentioned without analysis four times.) Agreeableness, and motor tendency to say Easy.—Motor tendency to say Quite easy. Faint but massive organic sensation in background.—Verbal idea, This is easy, and visual image of my smiling face.—Bodily attitude and relaxed muscular sensation. (In the remaining analyses the same factors are repeated.)

EXPECTATION. Analysis agrees with those of Pyle's observers (this JOURNAL, XX, 1909, 530 ff.).

FEAR THAT I HAD REACTED TOO QUICKLY. F. Slight sinking in the stomach or diaphragm. Lack of clearness of perception, and sensations from breathing.

V reports a state which she calls FRIGHT, and which usually occurs at the beginning of an experiment. This is analysed three times as consisting of a shiver down the back, and a shrinking backward. Once it consisted, in addition, of holding the breath and gasping; and once it is described as a feeling of nervousness and a shiver. The state of SCARE, which might be supposed to resemble fright, is reported only once, and is described as a sudden muscular contraction. C twice reports *fear* as an unsteady organic sensation.

G-CONSCIOUSNESS is reported by G three times. Once it is not analysed; once, said to be motor; and once, to consist of the muscular setting of the tongue.

HAVE FINISHED MY WORK. O. Bodily attitude which cannot be localised. Tendency to straighten up the body.

THE I-CONSCIOUSNESS. C. Was a kinæsthetic sensation in the back of the mouth.

I OUGHT TO KNOW THAT. O. Organic sensation and disagreeable feeling.

IMPATIENCE. O. Frowning, and the verbal idea Let's go.

INJUSTICE. V. Gasping for breath. I started back and threw my head back.

IRRITATION. O. Sensation from frowning. Visual image of frowning face. Tendency to lower and shake the head. Hot sensation in head and back. [In the four rather full analyses that follow, the above facts are repeated, and in addition strain in back and neck (three times), disagreeable feeling (three times), organic sensation throughout the body (three times), verbal ideas This is hard (once) are reported.]

IT MUST BE C. G. A pleasant touch-motor complex, with a horizontal movement, and a downward movement at the end. In the same report, this statement was followed by the attitude *I had C before*, which was verbal-kinæsthetic. The articulation was inhibited. This again gave place to the attitude *That is C all right*, which was a touch-motor complex with clear articulation.

MEANING. G. A single dot below the line means a broken T. This is a motor complex. O. Kinæsthetic and auditory image of the letters. Meaning carried by the shape of the figure itself.

The MEANING OF C is reported by G as an attitude, and is analysed as a complex of tongue-sensations and temperature in the mouth. Tendency to say the letter; pleasantness.

NEWNESS. F. "It impresses me as a cutting edge, as a bit of a knife blade turned up. Definite organic sensations. The whole complex I should call newness."

NON-RECOGNITION. F. Includes vague visual image.

The PASSAGE OF TIME. V describes this three times as a perception resembling that of air currents, passing around and over the observer from back to front; in one case there was the verbal idea That was slow. O says that a feeling of length of time came in kinæsthetic terms, and resembled fatigue.

PASTNESS. HC. The image was projected back into the past. Pastness is more visual than anything else. It seems far away, and foreshortened.

POWERLESSNESS. HC. This was a peculiar tingling sensation all over the body, with sensations similar to fatigue, and warmth.

PRIDE. O. Slight tendency to straighten up my neck and smile. Pleasant feeling.

The READINESS TO SAY A CERTAIN WORD is in one case localised by G in the lower part of the head, and again analysed as a disposition or set of the muscles of the mouth.

HC. REASONING that, if Canute was connected with 1026, Alfred was in the 10th century. This was partly represented by a visual schema of the centuries. Canute was in white at 1026, Alfred in dark, therefore in the 10th century.

REFLECTION. O. Thought turned alternately from A to B. (No further analysis.)

RELIEF. G. Pleasure, and disappearance of organic complex. Pronounced exhaling. O. Consists of organic sensation.

SATISFACTION. C connects this with pleasantness. O. Instantaneous pleasant feeling; faint visual image of my smiling face. Organic sensations.—Pleasant feeling, tendency to smile, organic sensations.—Tendency to smile. Verbal ideas: Yes, it is quite sure. (These analyses are repeated a number of times, while there are also cases in which satisfaction is named but not analysed.)

SECURITY. V. Long, easy breathing and straight position of body; relaxation.

STRANGENESS. F. Weak organic feeling all over the body. Strain, and sensations from breathing, and special sensation from diaphragm. This last is not a strain. It must be one of the sensations that we get when we fall in dreams. O. Insufficient adaptation of body, fingers, and hand. General inhibition, which was a kind of organic sensation; inhibition of arm-movement.

TENDENCY TO STAY AND FIND SOMETHING ELSE. O. Consisted of bodily attitude.

Conviction THAT I WAS RIGHT. V. Reappearance of the verbal image of the letter to which I had reacted.

The attitude THAT I SHOULD HAVE PRESSED SOONER, V describes as a twitch in the finger, organic sensation, and catching of breath.

The conviction THAT IT WAS NOT ANY OF THE OTHERS. G. An inhibited motion of the lips to say B, and the fact that I did not move horizontally and therefore it could not be H. This was partly kinæsthetic, in the fingers and mouth.

THAT IT WAS PROBABLY NOT G. V. Verbal ideas, and visual and kinæsthetic images, of the other letters.

THINKING OVER. O. Consisted of bodily set, and of associations which were not perfected. D and J were repeated several times in auditory terms.

UNEASINESS. O. Reported four times. Once identified with uncertainty. Once includes image of frowning face, and sensations in back of head and neck. Once is a verbal idea, That has no meaning. Once is not analysed.

UNFAMILIARITY. G. The touch-motor complex was unfamiliar and unpleasant. It led to movements of tongue and lips in whispering: Oh me, that must be H. Organic attitude in trunk; unsteady shutting of eyes and horizontal movement of eye-balls. V. Rapid mental comparison of feeling of C now with feeling of C last year, though I do not remember how C felt then.

The UPPER ROW WAS TOO SHORT FOR J. O. Tactual memory of J. Bodily attitude.

WAITING. O. This is described twice, in almost exactly the same words. Sensation of heat in back, stamping of feet, and extreme unpleasantness.

WONDERING. V. Once not analysed; once organic attitude, holding the breath and strain. HC. Once merely reported; once described as a complex of sensations in the top of the head.

ATTITUDES NAMED BUT NOT ANALYSED. Besides the attitudes named, there are others which are merely reported and not analysed. They include one case each of identity of self with the lever (G), the motive to distinguish the dots (G), the consciousness that I had reacted (G), the C-consciousness (G), not being right (F), curiosity (O), relation (O), that has no meaning (O), indecision (O), consciousness of an obstacle (O), unknownness (V), fast reaction (V), contrast (MC), sense of past time (HC); and two cases each of certainty (V), wondering (MC), and ownership (MC; this was at least partly visual).

Many of these incidental analyses are, evidently, imperfect. Even at the best, the observers might report in large and sweeping phrases, such as 'bodily attitude' or 'organic sensation.' There is, however, no doubt that the reports were intended at the time to represent the attitudes themselves, and not merely incidental or concomitant occurrences. After the second set of experiments, the observers were confronted with an outline of their reports upon various attitudes, and were asked to say whether, so far as they could remember, the analyses read were, as analyses, correct. The regular answer was that they were correct, and in several cases the observer added, of his own accord, that he could reproduce the attitude, at the moment, and that it corresponded with the analysis given.

While, therefore, we readily admit that introspective analysis might, under more favorable conditions, have been pushed further, we believe that the descriptions given are reliable, and that more detailed work would simply resolve the complexes mentioned into their elements.

3. Gradation of Imagery

Messer finds five stages in the *Entfaltung* of visual images: (1) mere spatial direction or externality; (2) a trace of visual localisation; (3) vague and schematic images; (4) images just named, and not characterised as to degree; (5) very

clear and strong images. In addition, he distinguishes general and particular, partial, changing and moving, and symbolic images. The stages found in the observers in our own experiments are as follows:

P mentions only two stages, and these were only in visual and verbal imagery. The two stages were the vague, and those merely named.

F distinguishes the following stages. For visual images, mere localisation, vague, and just named. For verbal images, which do not lend themselves to exactly the same classification, very vague, just named. Auditory images fall into the same two classes. The idea of movement, which is both visual and kinæsthetic, is very often merely named. Organic sensations were faint, and just named.

V. For visual images: faint, just named, very clear, partial image, change, and movement. For verbal: faint, just named, and very clear.

MC. For visual images: vague, schematic, very clear, partial, change, generic. For verbal: vague, just named, very clear, aloud, partial. For auditory: very vague, just named.

HC's images are in general much like MC's. Visual: localisation vague, just named, very clear, partial, change. Verbal: very clear. Kinæsthetic: vague, just named. Motor: very clear. Auditory: vague, just named.

O has for visual images: localisation, vague, just named, clear, incomplete, movement. He also speaks on several occasions of 'initial associations,' which seem to have been inhibited tendencies toward the articulation of words. For verbal: faint, just named, very clear, aloud, partial. Auditory: same as the verbal, and usually connected with them. Organic: faint, just named, very clear, changing, movement.

G reports for visual imagery only three cases; for kinæsthetic other than verbal, five; and these are all described as vague. His organic sensations are mostly merely named, but a few are faint. On any page of G's reports the verbal stages just named, whispered, and aloud, may be found; yet there is an unmistakable general tendency which, as in the case of V, is in the opposite direction to the order here given. G invariably read the letters aloud when they were being felt for the first time. As they recur again and again, the verbal ideas involved in recognition fade out, from whispered to vaguely verbal, and finally to a mere setting of the mouth or right breathing for the utterance or a certain letter.

Illustrations of the Stages of Imagery.

These typical illustrations of visual imagery represent a large body of similar cases, which cannot be quoted for lack of space. No one of the

observers was instructed to report on the intensity of his images; the experimenter had not this specific problem in mind at the time when the introspections were taken. As the illustrations show, it is extremely difficult to draw a sharp line between the consciousness which is rich in images and that which is 'imageless.' Images may be so vague as to be noticed only by the most careful introspection; and there is every reason to believe that some may escape notice entirely; that, in certain cases, the introspections even of trained observers may not be complete.

MC.

Vague. Vague image of a Massachusetts street. Vague image of a drug store. *Schematic.* Visual schematic image of June in my representation of the months. An image of an environment, a sort of mist, but very vague. *Very Clear.* An image of the girl, including details with much distinctness, such as her light, fluffy hair, bright pleasant eyes, and short dresses.

Partial. Detached image of a face with no setting. Image of a man in the rigging of a ship, but no setting, even of a whole ship. *Change.* Image of the man stepping into the room from the street and looking at himself in the glass. This picture was painted before me. It was not distinct at first, but one part became clear and then another, till the whole was clear.

O.

Localisation. Localisation of the letter in the alphabet slip. (This is repeated many times.) *Vague.* Vague pyramidal image of something. *Just named.* Image of H in point. *Clear.* Clear image of the letters.

Incomplete. Incomplete image of a Japanese key. *Movement.* Image of a worm moving.

V on the recognition of A

The illustrations begin at the point where color is first associated with A. Oct. 22: Visual image of A written in red; Oct. 26: Very brilliant red; Oct. 28: Vivid flash of red; Oct. 30: Visual image of red A in front of me; Nov. 2: A red flash and a little visual written A; Nov. 4: Visual image of A in front of my eyes, and a flash of red; Nov. 6: Faint flash of red; Nov. 6, later: I visualised the two dots; Nov. 9: Slight red blot. After the reaction, a faint visual A. (See p. 234.)

To demonstrate a series of gradual steps from clear images to 'imageless' thought may not prove conclusively that the latter is a fiction; but, at any rate, it suggests an origin and derivation. Imageless thought, as its name implies, is, so far at least, an entirely negative concept. We perform acts of thought in which we can discover no imagery in consciousness, and hence we infer that thought may be 'imageless.' Just what an imageless thought is like, or how it differs from that in which images are present, has never been shown, or even attempted to be shown, except by way of classifications such as that of Bühler. In fact the term 'imageless' is unfortunate; it lends itself easily to misunderstanding. 'Image,' in popular parlance and often in psychology, means a centrally aroused representation of a visual impression. We must, of course, recognise also the place of auditory, tactual, and kinæsthetic imagery, and theoretically of images of taste and smell, though these appear to play but a small part in consciousness. The verbal image, which is especially important

in the thought-process, may itself be visual, auditory, kinæsthetic, or mixed. Even this list, however, does not exhaust the contents of thought. It is becoming increasingly apparent that our conscious states take much of their peculiar quality from the organic sensations, the felt bodily adjustments, which enter into certain situations. The affective processes are also often present, even in thought. It is obvious, therefore, that the term 'imageless' is inadequate to designate a thought from which all these elements are absent. Even the term 'non-sensory,' which is better, disregards the part played by feeling. We all know in a general way, however, what sort of state is meant by 'imageless thought,' and it is just this state which the above introspections tend to discredit.

For they show that imagery does not need to be specific and elaborate in order to carry thought. We may repeat an argument, or review an article, in a very small part of the words used in the original, without sacrificing the essentials of the content. When we are thinking in verbal images, it is by no means necessary to say every word which we should use if we were talking aloud. Again, just because we are not speaking aloud, it is not necessary that every word should be clearly articulated or completed, either in actual throat movements or in images of such movements. The reports of G, especially, show that the mere setting of the mouth, or the right mode of exhalation, serves as well as the complete word. A young child just beginning to read gets no meaning from his words unless he reads them aloud. Thought consists for him in the sound of his own voice or that of another, or in the feeling of the throat movements involved in speaking. When he first learns to read quietly, he whispers; then he confines himself to a mere lip motion; and later, he can dispense with this expression. The reports of our observers take up this progress where the child leaves off, or from an even earlier point, when the words are still spoken aloud, and show that and how the suppression of sound and the shortening of the total process may be carried in the adult to a stage yet more remote from the starting point.¹

DETAILED ANALYSES

1. *Explicit*

The attitudes so far analysed have been those which occurred only a few times. It shall be our task now to consider

¹We are able, owing to limitations of space, to print only the few samples of visual *Entfaltung* given in this section. We have a very considerable amount of introspective material bearing upon the gradations, not only of visual, but also of auditory, kinæsthetic and verbal imagery, and of organic set or adjustment. We hope to present this material in a later article.

some of the more common attitudes in greater detail. One of those which is most often reported is SURPRISE. Surprise, of course, may have various occasions, and whenever these are stated by the observer, they are given in the following quotations.

G. Surprise at the smallness of the letter. Kinæsthetic adjustment, or inhibition of movement, in finger and back.

That I did not feel the letter. Organic sensation, involving inhibited breathing and fixity of the diaphragm.

At not feeling the letter. Something moving along inside the body, a dull pressure going upward from the stomach to the back of the mouth.

Check of horizontal movement and change to vertical.

Peculiar movement of mouth, dropping of jaw, and slight sensation in chest.

Inhibition in diaphragm and setting of the mouth to say Oh. [This last is repeated several times in almost exactly the same words. In two cases the attitude is not analysed at all, and in others it is merely localised.]

O. Muscular strain and visual image of a working nerve. Unpleasant feeling.

Change of position. Organic and muscular sensations somewhere, and blank consciousness.

Relaxation of muscular strain, and a tendency to change the bodily attitude.

V. Holding of breath and kinæsthetic sensation at finger tips.

Running of warm currents all over the body, and tingling sensation. Very pleasant.

Verbal exclamation.

Kinæsthetic and verbal. I dropped my jaw, and opened my mouth. Sudden muscular contraction, a gasp, and turning the head.

Muscular contraction.

Held my breath and gasped and contracted muscles.

On comparing these reports, we find that surprise is, in general, an inhibition of movement, or change in its direction, often accompanied by sensations from inhibited breathing, organic sensations, verbal exclamations, and affective processes. The important thing seems to be the change or inhibition of muscular reaction. Surprise may be called the conscious aspect of the adjustment to a new and sudden event in the environment.

The consciousness of SEEKING for something, of trying to remember, is called by Marbe a *Bewusstseinslage*, and is classed by Messer as an affective attitude, in which the relation of the *Aufgabe* to the object recedes, leaving a subjective state for whose solution the *Aufgabe* suffices. Watt affirms that the consciousness of seeking for the reaction-word is not present in every experiment; when present, it consists of a consciousness of direction, and an emptiness of consciousness, with a repetition of the *Aufgabe*, and sometimes a visual image. Orth says that the attitude of striving to find is a complex of organic sensations, bound up with the representation or immediate consciousness of a goal. Messer assumes an at-

titude of seeking, which is unanalysable, but finds with this in the whole situation motor processes, movements of the head and eyes or representations of such movements, organic sensations, strain and obstructed breathing.. All these components may not be present in a given case. In his "Snap Shot of a Hunt for a Lost Name," Bailey finds three stages, which include visual images, kinæsthetic and organic sensations, and pleasure, beside several complexes such as belief.¹

As the experiments on point-letters were not suited to bring out this attitude, special introspections were taken. The observers were MC and HC. Some of the analyses occur in experiments given for another purpose, and in a few cases the occasion for trying to recall arose incidentally, and the descriptions were written down immediately. Since these cases did not promise to be very numerous, however, a special method was devised. The observer was shown an old and almost forgotten picture of her classmates in the High School. All of the picture was covered except one face, and the observer was asked to recall who the person was. Whenever the response was immediate and no seeking was required, the case was thrown out, and another face exposed.

MC. Visual image of the face, and verbal idea of the name X. In trying to think of the right name, I experienced a kind of working or agitation localised in the top and back of the head. Several names came to consciousness, and visual images of persons that I associate with this girl.

Visual image of the picture and also of the girl. The first glance brought a verbal image of a name XY, followed by images of XY in two situations. I have also a feeling of time, that is that XY was much farther back in time than the subject of the picture. I do not know what this is. It seems to be chiefly a series of instantaneous pictures.—

In other cases, events and scenes which might suggest the name are recalled visually, laughter and voices are heard in image, and even the peculiar carriage and gesture of the person are imaged by the observer. In most of the cases recorded the attempt to recall was unsuccessful. The reports contain also frequent reference to sensations from squinting and closing the eyes, sensations of 'drawing' in the top of the head, 'emptiness in the head caused by the inability to recall the name.' Again: "The brain working seems in this case to be in the front of the head instead of the back as before. Sensation in the eyes and vaguely in stomach. Feeling of unpleasantness caused by inability to remember."

The sense of seeking for something occurs about thirty times in the same observer's later introspections upon the meaning of words, and is invariably described as a groping feeling in the top of the head, with sometimes a knitting of the brows, wrinkling of the forehead, squinting of the eyes, and sometimes a visual experience which is described as staring into a blank field. Occasionally the object of search finally appears as a small object in the middle of this field. Consciousness seems less rich in content in these latter reports than in the earlier.

The introspections of HC were obtained under exactly the same conditions as those already discussed. The common element in them all is sensation from the diaphragm, though that from head and eyes is often

¹*Journal of Philosophy*, etc., iv., 1907, 337.

present. In the cases of seeking which occurred incidentally, the strain is very often in the eyes and forehead. Visual images abound, while kinæsthetic and auditory imagery is sometimes reported.

It is evident that the consciousness of seeking consists of strain in the head and eyes or internal organs, and a feeling of effort localised in the head, together with images of any kind which have any connection with the required fact and would be likely to recall it.

The attitude which occurs most often incidentally is DOUBT. No sharp line can be drawn, it seems, between doubt, uncertainty, and hesitation. The term used by the observer has, however, been preserved in the quotations, so that, if there is any inaccuracy in this interchangeable use of terms, it affects the deductions alone, and not the results from which they are drawn. It is certain, at all events, that in many cases the observers themselves did not distinguish the three attitudes, and that the same kind of analysis is given under all three names.

Doubt is one of the attitudes most often named by Marbe, Orth, and others; and in Ach's separation of *Bewusstseinslage* from *Bewusstheit*, it is included in the former class. It is assumed in general, all through this series of papers, that doubt cannot be analysed. Thus, Orth finds doubt accompanied by sensations in the head, organic and kinæsthetic sensations, images and feelings. "Doubt is not a feeling, but a complex state, whose constitutive element is the *Bewusstseinslage* peculiar to it." Here is really an analysis of doubt, *plus* the assumption that the analysis is incomplete, and that there is a central thread running through the experiences, which is indescribable except by the phrase that it always characterises doubt. Whether or not there is such an element is a question for introspection to decide.

The following accounts are taken from the introspections of G. *Uncertainty*. Slight organic excitement in the abdominal region. Verbal ideas: Well, what is that? The movement changed from the B to the C movement, which was actually repeated. Long dwelling on one impression. The disturbing other dot was always there. There was nothing pleasant after the reaction, because I was not sure.—Suspension of verbal association, or inhibition of movement in the mouth. The mouth did not set itself till the recognition was complete.—Verbal idea: What the deuce is that? The letter seemed too short; inhibited breathing, and pressure in larynx.—*Hesitation*. Hesitation between B and J. I set my mouth for B, then for nothing at all. Renewed touch-motor complex.—Familiar, then unfamiliar aspect. Kept finger on letter and pressed harder on last dot.

F. I was not certain. It did not feel quite right. I compared it with the tactual images. The perception had a blank place in it which did not belong to H, and the real H was in this space.—It was not a clear cut G and did not come forcibly.—*Doubt*. A came, but it was not exactly as it ought to be; E came, but I could not decide which it was. Strain from hesitation. I was not sure. Kinæsthetic sensation high up in arm. Not being sure was not anything in consciousness; I just did not react.—*Hesitation*. It

was not clear, and I kept feeling it. It was not H because not bulky enough; I said J, but it did not seem to be J because too big. I said C, but it was too big for C. Visual image of a triangle. J came, but it still seemed too big.—Kinæsthetic image in forearm and finger. Tactual sensation not very clear. I did not react.

It will be noticed that the element common to almost all of these cases is one which may be called negative: the failure to move on, and to complete the reaction. When there is no doubt, the process proceeds without interruption; but in doubt there is "long dwelling on one impression," "the finger is kept on the letter," there is "renewed touch-motor complex." In addition to this, there is, especially in hesitation, a vacillation between two tendencies; two aspects alternate in consciousness, or the mouth is set to say now one letter and now another, without saying either. Verbal ideas and organic sensations may be present. Doubt is connected with a lack of clearness of the tactual perception. As the reaction is delayed, the attempt to recognise is repeated, and the reaction is prepared for again and again.

O. *Uncertainty*. Swift succession of auditory-kinæsthetic verbal images, initial movements of tongue, and faint sounds. Queer sensation from bodily and facial attitude. Visual image of my face full of confusion and unpleasant feeling.—*Doubt*. Several initial associations, consisting of sensations from irregularly contracted muscles, and a visual image of them; unpleasant feeling, organic sensation above abdomen, and sensation from irregular breathing. Interruption of breathing, organic sensation in chest, and pain in back of neck. Organic sensation in back and spine.—The same, with verbal images.—Organic sensation in head, chest and abdomen, unpleasant excitement, faint visual image of my vexed face, organic sensation in both shoulders, muscular strain in neck.—Auditory-kinæsthetic images of A, and something unclear tried to come into consciousness but was inhibited. Organic and muscular strain in head and chest. (This is practically repeated several times.)—Initial tendency to produce B, C, or D. Faint verbal and auditory image of J, then "it can not be," with organic sensation. (This last is often repeated, sometimes with unpleasant feeling.)—Unsteady and recurring organic sensations, which continued a long time.—Organic sensation like heat in the brain, holding of breath, muscular sensation and pain. Absence of relief, the muscular strain persisted. Verbal idea "I might be mistaken." (Almost every introspection given here is reported a number of times. There are three unanalysed cases of doubt.)—*Hesitation*. Verbal image of D and C alternately. Verbal idea that the dots are very strange, disagreeable feeling, sensation in back. (This is essentially repeated several times.)—Tendency to stay and find something else. (Hesitation is once unanalysed.)

O's consciousness is made up very largely of organic sensations and strains, and shows much more affective coloring than those of G and F. Doubt and uncertainty were unpleasant and irritating.

P gives introspective accounts of the attitudes of doubt, uncertainty and hesitation; the analyses agree almost completely in being verbal. P's consciousness is so strongly verbal that whatever else was present seems, in most cases,

to have been so far in the background as to be overlooked. There are a few references to organic and kinæsthetic sensations, unpleasantness, holding of breath, and general strain. The fingers were sometimes moved over the letter again and again.

V's analyses of uncertainty are meagre.

I frowned and held my breath.—Unpleasant and annoying.—I could not tell the number of dots. I tried to count them separately, but finally had to rely on the image I got from the whole sensation.—*Doubt*. The dot seemed flat and did not fit well into the finger.—The letter did not fit. I held my breath and muscles stiffened. Muscular strain and verbal idea, Perhaps it was D.—Frowning, vague organic complex, and verbal idea: I am not sure. (These are all repeated several times. For V the doubt in these recognition experiments usually came after the reaction, so that it could not consist in the inhibition of reaction. V's recognition, whether right or wrong, was usually immediate, and the reaction time was very short. In the few cases in which doubt occurred before the reaction, the time is increased above the average. As the feeling of fitting on the finger is the most common element in V's recognition, so the absence of this fitting most often marks doubt, but it is very often accompanied by an inhibition of breathing, muscular strains, and verbal ideas of doubt.)

Doubt does not occur in MC's reports, and occurs only three times in HC's. It is here analysed as a feeling of displeasure, organic sensations from stomach and diaphragm, and alternation of attention from one visual image to another.

Although the observers differ strongly in type, it is easy to see that there is a general agreement in the analyses of doubt. It involves an inhibition of the reaction, a checking of the habitually smooth-running process. So far, it might seem that doubt and surprise are alike; but there is a difference. Surprise involves a sudden checking or changing of the motion begun, whatever it is. Doubt tends to check the reaction, if it has not already taken place,—to lengthen the reaction time. The motion involved in feeling the letter, however, is not checked, but is prolonged or repeated. The observers of verbal type have verbal ideas of doubt; others have organic and strain sensations, and often unpleasantness. There is a marked tendency to use the term *hesitation* when there is a vacillation from one word, image or form of reaction to another. The organism meets a situation to which it is not prepared to react promptly. This may be because a particular reaction is begun, and then inhibited, or because several are initiated in swift succession, and inhibit one other. We may recall Washburn's derivation of the feeling of "but." The incipient movements of developed consciousness, in which the mouth sets itself to say now one word, now another, or the hand to make this or that reaction, may be vestiges of larger movements following one another in swift succession and tending to carry the body in opposite directions or to set it for incompatible acts.

2. *Genetic*

The fact of development has already been recognised by the writers on attitudes, though its whole bearing upon the question has apparently not been seen. This statement holds in particular of the case of the *Aufgabe* or task. Marbe reports a *Bewusstseinslage* which the observer called 'memory that it must be answered in a sentence,' and again one that the observer called 'recollection of the problem.' The first of these is referred to, with approval, by Orth, and is placed by him in the second group of his classification. If we turn to Watt's work, in which the course of the experiment is divided into four parts, we find that the *Aufgabe* is not only clearly recognised, but is also analysed and genetically developed. Watt is specific upon the point that the task (or part of it) gradually drops from consciousness as the series proceeds, but that the degree of consciousness of the preparation has no relation to its effectiveness. Messer is, in this matter, in entire agreement with Watt and Ach.

The course of our own experiments was at no time divided into parts, and in general little attention was paid to the consciousness of the task. Sometimes, however, voluntary reports were made, and at other times the observer was asked, at the time of introspection, if the task had been present before the reaction. The instructions were not repeated at the beginning of every hour. At the time, this fact did not seem worthy of notice; but we believe that they were never specifically repeated, to any observer, after the first hour of work. The instruction to recognise a letter is so simple as not to need repetition. The letters in alphabetical order were usually given to the observer at the beginning of the hour; but sometimes he reported, as we have remarked, that he did not need them again. This reminder may have served as a renewal of the general consciousness belonging to the task. Again, the general position of the body must be resumed at every sitting; that is, one finger must be on the reaction key, another at the edge of the card holder, the eyes shut. In so far as the *Aufgabe* is carried by bodily position, it must always have been present.

The TASK is specifically reported in a few instances.

G. Verbal ideas: I must make up my mind to react, and an uncomfortable bodily attitude, very unpleasant. (This was not reported as a part of the fore-period. The recognition and reaction seem to have been delayed, and the task is recalled in order to hasten reaction. This occurs in the second experiment of an hour, the ten letters having been felt at the beginning.) In a second case, the task is analysed as the organic setting in saying: Hurry up, don't be so long. (This too is a case of delayed reaction, and is the seventh of a sitting, the letters having been felt at first.) V reports the task to press the button as being present in kinæsthetic terms. This

is in the fourth experiment of the first hour of the second series. The recall to consciousness does not seem to have been occasioned by any difficulty. In the third reaction of the next hour V "forgot the *Aufgabe* to react," and therefore did not react as soon as she recognised the letter. The whole present purpose was to recognise the letter, and this purpose was a muscular adjustment, and concentration of attention on the finger tip. In the second experiment of the next hour the task was present in motor terms, and especially in a strain sensation in the finger, which relaxed after the reaction. F reports what he calls the "hurry-up" consciousness, and again the *Bewusstseinslage* that I must do it quickly. The former is analysed thus: Strain became noticeable in the abdomen, as if two sensations came from the sides and met. The "hurry-up consciousness" is mostly strain. Again: Organic sensations from diaphragm. The muscles of the diaphragm seem to come up and press the lungs, and the muscles of the ribs seem to tighten. (This always comes with the strain of waiting.) Again: Strain when I heard some one walking. The strain meant "hurry up." (This is often repeated in the same terms. The "*Aufgabe* to do it quickly" is described twice as consisting of muscular strain.)

Nearly all these cases occur early in the second series, and the *Aufgabe* is not later reported by name. It does not follow, of course, that it was not in consciousness at any other time, or that it was not reported in its elements. The conscious contents occurring before the perception of the stimulus were often complex and important, and in some cases occupied much more space than the rest of the introspection.

In the early part of the series O reports sensations from the different parts of the body, as the bending of the neck, stamping of the feet on the floor, pressing together of the teeth, and auditory images of the sound made by the finger in moving over the paper. About the middle of the series he several times remarks: "I did not notice the bodily adjustment of attention," and in the last thirty or more experiments the introspection usually begins with the perception of the letter. If there is anything before this, it is usually the auditory sensation from the rubbing of the fingers over the paper. The strained condition of the body is mentioned only once in the last thirty cases. In the reports of F, also, we notice a marked falling-off in the number of conscious contents occurring before the appearance of the stimulus. The first introspection is almost entirely an account of the fore-period, and includes strain, breathing sensations, kinæsthetic, temperature, verbal and visual images, some of these occurring several times. In the experiments immediately following, the contents of this waiting period are only slightly decreased. Later the observer reports: Kinæsthetic and visual images of moving fast over the letter. Later, again: The 'ready' set me off without a conscious *Aufgabe*. The idea of movement with the tactual image is repeated a great many times, but toward the last is described as vague, and does not appear at all in some of the latest observations of the series.

The conclusions to be gathered from these data are in entire agreement with the findings of Watt, Ach, and Messer, who offer us not only avowed analyses of the *Aufgabe*-consciousness at the beginning of a series, but also repeated proof that it is shortened and modified and tends entirely to disappear. If any observer were stopped just before a reaction, and asked to state in words what he was about to do, he would doubtless be able to reply. We may reason, logically, that he could not state what he did not know, and that here is therefore a case of 'imageless' knowledge. It

may be answered: (1) that such a statement would be a clear case of *Kundgabe*, a report of the significance of a total state and not a description of contents; (2) that, even if such a report be conceded to be the verbal expression of an 'imageless' state, it is nevertheless shown to have derived by direct development from a consciousness whose contents could easily be isolated; and (3) that, so far from any indication that the *Aufgabe* was present in other than sensory terms, it is specifically said not to have been consciously there at all, and yet to have been active. The reports throw us back upon unconscious tendencies, but not upon an unanalysable attitude or an imageless thought.

The attitude which in our experiments shows best from a developmental point of view is RECOGNITION. From the nature of the point-letter experiments, it follows that every introspection is really an analysis of the recognitive consciousness. It may not be complete, and it may on the other hand contain experiences that were incidental, but in the main it represents recognition. The letters were absolutely new to the observers when the experiments were begun, and when they were ended most of the letters were recognised both accurately and promptly. Our conclusions will, however, be based chiefly upon the second series, in which the time was measured. To part of the observers the letters at the beginning of this series were not entirely unfamiliar.

It is to be supposed *a priori* that, as the experiments proceed and a letter is given again and again, it becomes more and more familiar. This inference is supported in a general way by the curves of accuracy and of time, which show that on the whole all the observers make fewer mistakes toward the end of the series than toward the beginning, and that the time required for reaction becomes progressively shorter. Sometimes, it is true, cases of false recognition or of long reaction-time occur at the end of a series. These can usually be explained, however, as due to accidental causes. For example, the raised letters tended to become worn off, and to grow less distinct with repeated rubbing. Care was taken that they should be replaced before this injury occurred, but sometimes it escaped notice. The introspections enable us to trace most of the irregularities to these and other causes. Even without this allowance, however, the curves show a striking similarity of form, and, with one exception, an invariable tendency to decrease both of mistakes and of reaction-time as the series advances. Curves of the length of the introspections, in lines or words, would show the same general slant from left to right. Of course, such a result could have only the most general application, but the differ-

ence in length of introspections is striking, and, taken with the other indications of shortening, has a certain significance. At the beginning of any series there are usually one or one and a half introspections to a type-written page, while at the end they average from five to ten, according to the observer.

The letters chosen, which were the first ten of the alphabet, turned out to vary greatly in degree of difficulty. E, being a single point, was the easiest of all. F, I, and A were also easy, while G, D, H, and J were difficult, and B and C stood midway. The intermingling of these difficult and easy letters brings irregularities into the times, and makes it necessary to study the letters separately.

The letter which gave O the most trouble was D. The average time for D was longer than that for any of the other letters, and the letter was usually not correctly recognised. In fact, it was called D only once, the last time that it was given. The reaction-times are very irregular, increasing gradually from the beginning, suddenly dropping about the middle of the series, and then again increasing. At first D is confused with G, but later consistently with J. The number of elementary experiences reported varies roughly with the reaction-time. When D first occurs (D. j, 4.42), the introspection includes perception of shape, organic sensation, disagreeable feeling, and images. In the next case (D. g, 8.40) the image of the reaction-letter comes verbally as well as auditorily, and there is doubt. Otherwise the report is essentially the same. In the third case (D. j, 11.62), consciousness is still more complex, and includes repeated perception, more complex verbal images, and several visual images, of which some are merely associative. In the fourth (D. j, 10.24), there are added frowning, irritation, organic sensations throughout the body. "Very disagreeable. So many sensations and images that I cannot remember them all." In the next, there is a marked decrease. In the next three or four, there is increase again; and in the final case (D. d, 15.42), the observer says: "Auditory image J, or D. I thought it over again and again. This was bodily setting, and associations which were not perfected. The whole was accompanied by strains and organic sensations, verbal and visual images, and unpleasantness, especially at the last." Evidently the observer himself was not satisfied, and the reaction to D was not a true recognition.

This series will serve as an example of the correspondence between amount of content and reaction time. It is evident that we have not here before us a growth of the recognitive consciousness. As the letters in alphabetical order were given to the observer at the beginning of the hour, he could not form a closer and closer association between the letter D and the name J, which the repeated wrong reactions might otherwise have caused. So we find irregularities, with a tendency toward increase rather than decrease. The result shows, so far as one case may do, that the shortening to be observed with increasing ease of recognition is not to be attributed to a general habituation to this form of experiment. The change due to habituation can be observed, but it occurs mostly in the fore-period, and it is not sufficient to account for the progressively shorter reactions to particular stimuli.

The letter A, which for most observers was one of the easiest, was for O next in difficulty to J. It shows, however, a different change in consciousness. A is always recognised correctly except in one place, in spite of its difficulty, and consciousness shows a general though very irregular prog-

ress from complexity to comparative simplicity. In the beginning (A. 2, 14.78) O reports difficulty of perception, organic sensations in abdomen, spine and back, disagreeable feeling, verbal ideas, auditory-motor images, and doubt, which last was a tactual memory image of the former size of the dot and a comparison of this with the sensation. In an introspection chosen from the latter part of the series, there are only tactual perception, visual image of dots, verbal idea A, and surprise. In this case the letter was rightly recognised, and the time was 2.78 sec. F and E show the shortest times, but they are not very regular. Practice was not carried far enough with O to reach automatic and prompt recognition. With every letter except D there is a change toward simplicity of consciousness and shortening of reaction time.

The letter C was one of the easiest for the observer F. The introspections may be compared with the time curve. C. c, 3.20. The reaction was unnecessarily long, I forgot to react. Tactual images as I moved my finger, especially an image of touching the lever. Sensation of strain in shoulders and chest, slight interruption of breathing. Attention all on tactual images. As I was moving across I had the verbal idea: Tactual images. C is a movement across and down. It is kinæsthetic and tactual. C came up verbally and auditorily. Saying C recalled the *Aufgabe* to react, in what form I do not know. C. d, 3.30. Visual and kinæsthetic image of movement. I said 'as before' while I was moving across. Tactual image of a point. Touched the letter, and I came up verbally. I knew that it was not clear enough; it did not fit into what I know I is. The whole complex was not just right to produce reaction. I felt twice more and D came up. The reaction still seems just like saying the letter. 'As before' meant going over it without attending to the lever. C. c, 2.16. Idea of movement, partly visual and involving eye movement. D came up at first; then I felt the rest of the letter, and C came up verbally and auditorily. The breathing was right to say C. I was trying to catch the verbal image and noticed the breathing. C.—1.96. Strain when I heard some one walking. This strain meant 'hurry-up.' I touched the letter and it was not clear at first. I felt it again. It was familiar, but I could not think what it was. C. c, 2.10. I felt two dots above. Attention on upper dots, then vague perception of lower one, and I moved down to feel it. This motion named the letter. C. c, 0.96. Tactual and kinæsthetic image of feeling the letter. The location of the letter in advance is kinæsthetic and tactual. C was visualised as a dark mark. C.—1.16. I did not recognise the letter. It was very clear. I reacted to the tactual sensation. C. c, 0.62. I set myself muscularly, touched the letter, and moved part way over it. F came up auditorily. I moved the rest of the way and C came up. Reaction and relaxation. C. c, 0.44. Vague tactual image and muscular set. Clear tactual and kinæsthetic sensation. There is an image of the kinæsthetic sensation which enters in and makes a part of the C. When I move my finger straight across, it seems as if I had moved it down. This is an image. Auditory image C after reaction. C. c, 0.36. Idea of movement. I felt it, and the letter C came up.

The reaction times of V are uniformly short, but show a very regular decrease. There is a striking similarity among the curves, some of them being scarcely distinguishable. Early in the series there are mistakes, and some entire failures to recognise the letter. In far the larger number of cases, however, the recognition is unerring and the reaction times are short. It has already been shown (p. 223) that the color images, which accompany certain letters for V, gradually fade out. In the introspections, of which we give but the briefest sample, there is a corresponding disappearance of other conscious contents.

In the case of H, V reacted to a vague mass. The voluminousness seemed to be the one thing recognised; and she recognised the letter in a fraction of a second just from its voluminousness, long before the shape

began to be definite. J was associated verbally at the beginning with the strange thing which did not fit, but this letter too came later to have more definite outlines.

As G had done no experiments in the first series, the introspections here given represent the whole course of improvement from the first presentation of a letter to its almost automatic recognition. I. i, 1.86. At first a touch complex which was focal. Repeated movement in the vertical direction, which led at once to recognition and verbal idea I; movement and verbal idea focal, organic complex vague. Feeling of recognition pleasant. I. i, 2.82. Horizontal movement with complex touch led to no recognition but to vertical movement over the dots. Visual image of I and very pleasant mood, localised in trunk. This might be called ease of recognition. I. i, 2.60. Slight surprise, that is a check of the horizontal movement, and a change into the vertical, with peculiar movement of the mouth, a dropping of the lower jaw, and slight sensation in chest. The setting of the mouth led involuntarily to saying I aloud, and reaction. Last slightly pleasant. I. i, 1.40. I is recognised by the checking of the horizontal movement and the substitution of the vertical. Setting of the mouth to say I. Reaction automatic. I. i, 1.14. Inhibited horizontal movement. Strong setting of the mouth to say I, which lasted after the reaction and led to saying I. Slightly pleasant. I. i, 2.40. Slight setting of the mouth to say I. Indifferent or slightly pleasant. I. i, 1.16. Different from the usual I-consciousness. Motion not inhibited. Vertical motion replaced by tactual perception of two dots, one above the other. Slight pressing down of the lower part of the mouth, vaguely localised. I. i, 1.60. Movement horizontal, then vertical. Organic and affective inhibition of horizontal movement. As soon as this vertical movement was established, slight pressure of the larynx in setting of the mouth to say I. I. i, 2.22. Touch-motor consciousness, with change from horizontal to vertical very clear. Vague pressure in back of mouth. This was the I-consciousness. Slightly pleasant. I. i, 1.36. Stereotyped I-consciousness. I. i, 1.36. Stereotyped I-consciousness. Kinæsthetic part in back of mouth more pronounced than usual. Auditory image: I again. I. i, 1.60. Surprise. This was inhibited breathing and setting of the larynx and back of mouth. Later the common I-consciousness.

There can be no doubt that the introspections given, and the far larger body from which they are taken, represent recognition in the making. In the whole number of reports there are at most only one or two cases of the comparison of a percept with a memory image. There is not a single allusion to a quality of knownness attaching to the perception. The feeling of familiarity is reported thirty-five times, but in all but four it is analysed. The introspections of any observer show, in general, a dropping out of conscious contents, and a shortening of reaction-time going parallel with increased ease of recognition. Only one case was noted in which the process was reversed; the reaction-times here become longer instead of shorter, the conscious contents increase in complexity, and the letter is continually mistaken for another.

The cases of reported familiarity almost all occur in the first half of a series. Their analyses show that they are complex states, consisting mostly of strain and organic sensations, with some affective processes and accidental associations.

Among the final experiments of most series, where we may assume that complete recognition occurs, we find cases in which the reaction is said to be automatic, and the letter may be represented in consciousness by a setting of the mouth to say it, a visual image, a flash of color, or by nothing at all.

If the terms 'familiarity' and 'recognition' are used interchangeably by writers on the subject, it may well be that they were also confused by our observers. We should not lay too great stress upon the names applied to the attitude. With all allowance made for inaccuracy, however, there are suggestions here for the arrangement of familiarity and recognition along a scale of continuously varying complexity.¹

If recognition has received considerable attention from psychologists, so also has UNDERSTANDING. In fact, the two approach each other so closely in experience that it is impossible sharply to distinguish them. Our own experiments combined the methods of Ribot, Binet and Taylor. The stimuli were words, sentences, and paragraphs cut from magazines, which were read sometimes to the observer, sometimes by her. The stimuli were varied in two directions, from simplicity to complexity by means of the length of the passage to be read, and from sense to nonsense, some of the stimuli being strange or impossible words. If there is a special consciousness of understanding, it ought to stand out, by contrast, in a series in which part of the stimuli are not understood. The experiments were performed during the summer of 1909 with the observers MC and HC. The latter wrote introspections on only 100 single words; MC was given the same number of words and, in addition, 50 sentences and 20 paragraphs. The general procedure was that the observer drew a slip from an envelope, read the stimulus, and wrote the introspection. When the report was dictated, or the stimulus read by the experimenter, the fact is noted. The words used include nouns, both abstract and concrete, and various other parts of speech. In almost every case MC reports verbal and visual images of the word as the first thing in consciousness; and sometimes, if the word is not very familiar or is one whose meaning does not easily appear in visual images, it is repeated several times.

MC. It was invariably the case that, if the word was unknown to the observer, she immediately associated it verbally to some known word of similar sound, and the other contents of consciousness referred to the meaning of the known word. Sometimes only a part of a word was con-

¹Lack of space, again, forbids a discussion, in this and the following sections, of the views and results of earlier investigators. General reference may be made to Titchener, *Exp. Psychol. of the Thought-processes*. We hope to recur to the theory of recognition, in particular, in a later article,

cerned in this association. *Metappos.* Visual image of Italy and Switzerland on the map, accompanied by sense of direction. Verbal image of the words Matterhorn and Metaphysics. *Frostilla.* Visual image of a frosted cake, then of frost on a window pane. I do not know the meaning of the word, but think it may apply to some kind of extract.

Even when the word was understood, it was sometimes associated to others of similar sound, or divided into parts and then connected with images which referred to but a single part. This verbal association occurred most often when the word was a pronoun or preposition whose meaning was hard to grasp apart from context. *Display.* Visual image of the two syllables separately, and of a stage at the theatre. Later visual image of a woman overdressed, not very distinct. *Which.* Verbal image Witch, with visual image of a volume of Scott and of Meg Merrilies. Then repeated verbal image of the stimulus word, with slight groping in mind, followed by image of a page in a grammar.

By far the greater number of meanings were represented by visual images, and these were most likely to occur with words denoting concrete objects, though they were not confined to them. *Compartment.* Image of a train, and of the words 'train' and 'European.' Sense of direction and distance. Visual image of some pigeon-holes.

The contents of consciousness were usually far poorer in the understanding of such words as prepositions, which have little meaning apart from context. *From.* Repeated visual and verbal images of the word. Sense of distance and direction in going from one place to another. Visual image of a country road between two familiar places. *The.* Visual image of the word, then again in big letters at the top of a newspaper; no particular one. Then a blank. I shut my eyes and looked into a blank field. Consciousness of 'seeking,' but nothing came.

Sometimes the setting which the word called up was verbal rather than visual, and sometimes the verbal ideas constituted a definition. *Adjacent.* Word at first seen sideways and not recognised. The J was most conspicuous, and this came as a visual image, followed by verbal image; Dr. Jekyll and Mr. Hyde. Then visual and verbal image of the word, the latter many times repeated, and a sense of groping and looking into a blank field, though less blank than usual. It seems at times to be dotted with conspicuous black letters such as made up the stimulus word. Later verbal idea: Things close to each other. *Marvelous.* Visual image of a house occupied by Prof. M (name similar in sound to stimulus). Later verbal image: Wonderful. *Rose.* Visual image of a rosebush, and of two girls named Ross. Verbal idea: Roman de la Rose. Images were unusually numerous here, and I cannot recall the others. They seemed to be present all at once.

As might be expected, there are cases reported in which the word was understood, but the observer could not analyse the understanding. There are, however, only seven or eight of these among the hundred words, and in most of the exceptional cases there is some indication that sensations or images were present. *Right.* An immediate consciousness of the idea 'to do right.' "This was partly verbal, but I seemed also to see something of a schematic nature. I looked downward to see this." (Whatever the observer looked down to see must have been of a visual nature.) *Individuals.* Image of a light place (probably an after-image) with the word in it. It all seemed to be inside my head, then I seemed to try to get it out. Paralysed feeling. I knew what the word meant, but it did not suggest anything. Then visual image of individual people walking. They bowed. Knowing what it meant was a kind of comfortable feeling, a feeling that I could define the word. This was in the back of the head and throat. (The feeling that she could define the word, localised in the back of the throat, was probably the setting of the vocal cords to articulate the definition.)

These introspections, like those of Binet, Ribot, and Bagley, show cases in which the images were inadequate or contradictory to thought. *Noiseless*. Visual image of a house, of a very noisy family of boys who occupy it, also an auditory image of the noise of those children. This was accompanied by a sense of contrast, but I am too tired to analyse this. *Electric*. Visual image of a park that I once visited which, however, was not electric. There seemed to be in the background images of several electric parks but the other was more distinct.

In the next series, of 50 experiments, the stimuli were sentences of various lengths. Here, too, the meaning is most often represented by visual images, if the sentence describes a visible object or a scene. In such cases the whole scene may be painted before the observer's eyes, a part at a time, as the words come. *The engineer and fireman and one or two others were standing by the engine staring at it; and so they hastened thither, well ahead of the outpour of people behind them.* (Read by E.) The series of visual images came during the reading. Verbal images of first two or three words. Visual images of engineer, fireman, engine and crowd. *He climbed up the straight iron steps to the gangway.* Visual image of iron filigree work. Verbal image of whole sentence. Image of a person going up a gangplank in the Brooklyn Navy Yard's. Second verbal repetition of the whole sentence.

For this observer all sentences, even of an abstract nature, arouse visual images which represent, more or less schematically, the meaning of the whole or of single words. Sentences which are not descriptive may nevertheless be represented visually. *Every vigorous state pursues two principal aims: to enlarge its dominions and to preserve its independence.* Visual and verbal images of sentence. Words 'principal,' 'territory,' and 'independence' stood out most prominently. Even while I read, I connected it with my history work. Visual image of table at which I work, and a 'feeling' that the sentence belonged to me. Visual image of the Mississippi valley, schematic and a good deal in the background. The country was being extended into this valley. Sense of distance and direction to Atlantic states. The word 'independence' meant the Revolution. This was mostly direction and distance, and a schematic image of the Revolution. Independence Hall was included.

Some sentences arouse very little imagery, and yet are understood. *Life is ruled by the power of the deed.* 'Deed' was at first read as 'dead,' and gave an image of Egypt and some mummies. When I read it again, I knew what it meant, but it was not as clear as usual. Slow repetition of the sentence. Emphasis on 'life,' 'rules,' 'power,' and 'deed'. 'Life' called up an image of a Chicago street. 'Deed' gave an image of myself doing something.

The third series was similar, except that the stimuli were whole paragraphs, varying in length, but all longer than the sentences. Here again a description of anything which could have been seen is very fully illustrated by visual images. In some cases these are added as the words come, and make a whole picture; in others the images seem to refer to individual meanings of the words, and not to the whole situation. *An arduous task must have been that of the first ministers of the Jamestown Church. A part of religious services enjoined were as follows: on week days, early in the morning, the captain sent for tools in place of arms, when the 'serjeant-major' or captain of the watch, upon their knees, made public and faithful prayers to Almighty God for His blessings and protection to attend them in their business for the whole day after succeeding.* Visual image of some ministers. Sense of distance and direction to Jamestown, visual image of the town, and vaguely of a church. At 'religious services,' image of a church. 'Early in the morning' gave an image which seems to grow or develop. First there was what I call the representation of a morning, which was partly visual but included other sensations, such as the pressure of air on the

face. Visual images of captain, tool, army, etc. 'Upon their knees,' image of people praying.—Even when the meaning is abstract, there is still imagery.

The second series shows an interesting case of the process by which a visual image becomes stereotyped and loses its particular quality as it recurs repeatedly in the same connection. Several of the sentences were from an article on Buddhism, and this word called up the same association each time, with some modification, as follows. (1) Visual image of the word Buddhism and of a Dr. X whom I once heard lecture on this subject. Visual image of something brown, which represents India, and contains an idol. (2) 'Buddhist' gave image of Dr. X. A long row of idols and something brown. (3) Image of a sort of conventionalised Dr. X. Any reference to Buddhism always calls up Dr. X, and this has happened so often that the image seems to have ceased to be personal. (4) Visual image of Dr. X; it was rather an image of an image. (5) Schematic image of Dr. X.

The 100 introspections written by HC on the understanding of single words need not be discussed in detail. Some of the reports show that the meaning of a word may be carried, in whole or in part, by a motor image or an organic sensation. *Grip*. Visual image of a hand reached out to grasp something, and muscular image of the sensation in right arm and hand when something is grasped. *Approval*. Image of a person vaguely seen nodding his head and smiling. This was accompanied by motor images of the action, which were much stronger than the visual, and yet the latter was not of myself. *Stroke*. Swift motor image of striking something. *Wanted*. Organic sensation in stomach.

Several of these reports show well how the mind goes from one to another of several possible meanings when the word is presented without context. *Glasses*. Visual image of spectacles alone, then on a person. Then of tumblers on a table. *Reproduced*. Verbal image of the word. Visual image of my abbreviation for 'reproductive tendencies,' then of some eggs, then of two sheets of typewritten matter with a carbon sheet between. Verbal image 'manifold.'

Perhaps this is the least inappropriate place to say a few words about a series of experiments which do not belong exclusively to the discussion of any particular attitude, and yet throw some light upon the whole subject. Their only connection with the preceding is the fact that they were performed by the same observer (MC) at about the same time; their bearing is rather on imageless thought than on the attitudes proper. It will be remembered that Marbe used the *Ausfragemethode*, and that his questions were criticised upon the ground that they were too simple, and could be answered merely associatively, without any thought. Bühler avoided this danger by giving aphorisms, which offered some difficulty to understanding, or asking questions, which required, for instance, the consideration of whole periods in the history of philosophy in a brief time.

The object of the present series was to combine these methods into a differential or contrast method in order to bring out the difference in consciousness between the answer which required thought and that which did not. The subject chosen was history, because this was of special interest to the obser-

ver. She was asked 50 questions, chosen indiscriminately from many periods of general history, and ranging in difficulty from "When was America discovered?" to "What were the constitutional difficulties in the way of reconstruction after the Civil War?"

We find that visual images play an important part in this observer's memory of history. Centuries and special dates within them are seen schematically and often in colors, while persons and events are assigned to certain periods because they are seen to be in them or like them in color. *Name the first five presidents of the United States.* Answer: *Washington, J. Adams, Jefferson, Madison, Monroe.* Visual image of each man as his name was given. Jefferson was especially clear. With Adams, image of date 1801. Schematic image of length of terms. It was dark colored and had some spaces marked off, twice as much for two terms as for one. In connection with Madison, image of War of 1812 and of an old book on the subject. Adams seemed to stand in a corner, a turn between two centuries.

The facts of history as well as their dates are in many cases apparently read off from visual images which had represented them in the past. *Was there any connection between the French and American Revolutions?* Answer: *Yes. The French assisted the American Revolution and are said to have incited it. The French Revolution was influenced by the example of the American.* Visual image of a book on the subject. Image of the American Revolution and of arms and ammunition on a ship being sent by the French to America. Then of a Frenchman sitting in a coffee-house finding out public opinion about the Revolution. I seemed to see the two wars at the same time, and to know that the American happened first and was an example. *What became of the Celts when the Teutons invaded England?* Answer: *They were partly absorbed, partly exterminated, partly pushed into Wales.* Image of Wales and of Celts and Teutons fighting. Then of the whole country with some Celts and Teutons intermingled. This is what made me say 'absorbed.'

Sometimes the answer is so familiar and comes so readily that there is very little else in consciousness. *When was America discovered?* Answer: 1492. Visual image of the date with a red halo, also of Columbus in Spain with distance and direction to Spain. *Who first sailed around the globe?* Answer: *Magellan.* Visual image of Straits of Magellan, of the man, and later of the name. *When was the fall of Rome?* Answer: 476. Image of date, and of Rome surrounded by barbarous hordes.

Let us summarise the facts which the two hundred and seventy introspections show in regard to the understanding of words and sentences.

(1) A word which is not familiar calls up others which are similar to it in sound, and the images are appropriate to these familiar words. (2) Words like 'to,' 'which,' 'of,' which do not ordinarily occur without context and do not refer to an object that can be represented by an image, also show to some extent the tendency toward mere auditory association. Their appearance in this strangely unconnected position is usually followed by groping or blankness of consciousness. They often form a context for themselves, by verbal association with some word which could grammatically follow them. (3) Words which refer to objects of sense, visual or otherwise, are often represented by images. (4) Words which are capable of more

than one interpretation usually excite in quick succession images appropriate to the different meanings. (5) In comparing the average length of the introspections on words, sentences, and paragraphs, we find that they are in no sense proportional to the length of the stimulus; on the contrary, they are all of about the same length.

The very fact that the single words stood alone, out of all connection, introduced an unfamiliar element, and gave opportunity for all sorts of associations. Experiments upon single words are, in fact, comparable to 'free associations.' When a word comes without context, and the time which the introspection is to cover is not definitely limited, the images, visual, verbal and other, which are aroused, are likely to be numerous and varied. Most of them refer in some way to some meaning of the word, or to its connection with events of our own lives; but some may be irrelevant. If now, we read the same word as part of a short sentence, we get somewhat the same effect as when an association is guided by a word just heard, or when the observer adds to the *Aufgabe* an additional self-imposed condition. The *Aufgabe* now is not "Get any meaning of the word," but "Get a meaning which goes with these other words." Moreover, the time is shortened; the words follow one another in quick succession. This limitation in time tends to inhibit part of the images, and the context determines which of them shall be suppressed.

It may be objected that it is not always the wrong association that is inhibited. Our introspections, as well as those of previous writers, show that often the images are inadequate, irrelevant, or even contradictory. So far as inadequacy is concerned, however, we have no criterion, save the facts themselves, by which we can decide how clear or complete an image must be in order to carry a meaning. Again, the image which is logically contradictory may yet have enough in common with the meaning of the word to be psychologically adequate to this meaning. Two words cannot, indeed, be spoken of as contradictory, unless they have something in common; they must at least belong to the same universe of discourse, to the same context; and it is just this context which, recalled in any form whatever, constitutes a more or less general meaning. Logically, it is not easy to see why a bird, described as white with a black ring around its neck, should be imaged in its ordinary colors; or why a description of dogs carried in a basket should give rise to images of cats jumping out of a panier. Our own experiments are not free from such anomalies. The word 'noiseless' arouses an image of some particular noisy children; 'electric' is followed by an image of a park which is not electric; 'home' recalls France,

and the idea that the language of that country has no word of the same meaning. In every one of these cases, however, there is sufficient connection between the logical meaning of the word, and the psychological content of the act of understanding, for the latter to carry a general meaning.

The third case, that in which the imagery is neither inadequate nor contradictory, but irrelevant, is less easy to explain. It is a fact of observation that the wrong meaning is not always inhibited by the setting and the additional *Aufgabe*, but runs along parallel with the understanding of the sentence. Every word, however, is not of equal importance for the understanding of the whole; and even if a single word is given a wrong interpretation at the time of reading, the meaning of the whole may be fairly clear. The introspections show cases in which the word was seen only in part, or was at first misread, and the context of the wrong reading immediately appeared in consciousness. This often occurs in everyday experience, without attracting attention. The mistake is corrected as we go on, and the wrong image is replaced by others which are more consistent with the meaning of the situation.

These attempts at explanation are tentative only. We have the fact that understanding may at times be mediated, psychologically, by images which logically are inadequate, irrelevant or directly unsuited to their office. The road to final explanation lies through a detailed study of the conditions under which such representations of the act of understanding take shape. Their appearance in experiments like our own probably depends, in many cases, upon ingrained habits of reproductive tendency, which by lapse of time are inaccessible to introspection. Our aim must be to catch them in the making,—either by casual observation in everyday life, or by way of specially shaped observations in the laboratory.

Unanalysable feelings of *RELATION* have been postulated by various writers. Woodworth, in particular, has made experiments with words and with papers of different colors and shapes, arranged according to the rule of three, which, as he believes, show that a relation is sometimes conscious as an 'imageless' thought. His verbal stimuli were presented in the form London: England: : Paris: X. The observer was to supply the fourth term of the proportion, and to give a complete introspection. The reports fall into four classes. (1) When the relation is easy to grasp and the missing term is readily found, very little consciousness appears. "There was nothing in my mind," said one of the subjects, "except that I wanted to answer your question right." The answer

comes immediately, on the hearing of the three given terms. (2) When there is more difficulty, the relation sometimes receives a name before the answer is found. (3) Sometimes the relation is pictured, in some form of imagery. (4) Sometimes the subject reports that he felt the relation, but did not name it or have an image of it.

Unfortunately, the author does not tell us what fraction of the whole number of experiments belongs to the fourth class. If the reports of this group were numerous, they might offer some evidence for the existence of unanalysable feelings of relation. If they were not, they may well be explained by the incompleteness of introspection. All observers probably fail at times to analyse into simplest terms, or to report all the contents of consciousness.

We have ourselves made several series of experiments on this subject, all of which, in form at least, are based on those of Woodworth. In the first series, the stimulus consisted of three words in the form of a proportion with the fourth to be supplied, exactly as in Woodworth's experiments. In fact, a few of the examples were taken bodily from his paper. The observers were V, G, and F.

The relation is sometimes present in consciousness as a word.

V. *A book: a magazine: : a chair: a stool.* Visual image of a red book and a magazine side by side. At hearing the word 'chair' great surprise,—a muscular contraction and a gasp. I looked at a chair in the room, then at a table. Tendency to say 'table,' because I had a kinæsthetic idea that a book is squarer and higher than a magazine. Same of table and chair. This was inhibited, I don't know how. Visual image of a footstool. Then I said 'less than a chair.' Then said 'stool' aloud. No balance. The whole took effort.

F. *Red: blue: : green: yellow.* I started to say this automatically. Then I repeated the stimulus and said 'intermediate' verbally. Some kind of consciousness that meant 'principal colors'. I did not say 'principal.'

G. *Family: individual: tree: fruit.* Verbal completion in background. Said 'group to one.' When you said 'tree,' I said 'tree is individual itself.' This was in the background. Articulated 'Tree produces what? Fruit.' There was no association ready, and I had to make one by making a new sentence. 'Species' also present verbally. Verbal part in background.

Sometimes the relation is represented visually, as in Woodworth's third division.

F. *Book: chair :: table: floor.* I saw a chair with a book on it. Visual image of a table on the floor. The relation was kinæsthetic and visual.

V. *Man: boy :: woman: girl.* Visual image of a small boy in a blue sailor suit. Meaning of 'woman' carried by a vague image of a red plaid skirt. Then a blank. I said 'girl,' but I don't know why. I was surprised when I said it. This was vaguely organic, and a little gasp occurred. The relation between man and boy was one of height,—a tall and a short line side by side. Just after I finished, I thought perhaps I should have said 'little girl.' This was vaguely verbal.

By far the larger number of relations which were carried in sensory terms could not be put strictly in either of these

classes, but were combinations of images from different sense departments. Organic sensations were prominent for all the observers.

V. London: England :: Paris: France. I did not think of London till I heard 'England.' Vague image of the map of England with a black dot standing for London. Kinæsthetic image of drawing a circle and putting a dot inside it. At 'Paris' I had a kinæsthetic image of making a dot, and visual image of a black dot. Without any effort I said 'France,' and had image of drawing a circle around the dot. Very pleasant. The pleasantness included a kind of balance which was vaguely visual and organic. At 'London' image of a capital L, and at 'France' image of a capital F.

F. To: fro :: back: front. Repeated the stimulus twice. Organic and kinæsthetic images or sensations of swinging arm in a circle while saying 'to and fro.' I marked the rhythm with words and breathing. Very vague visual images. A thin black thing which was moving like a pendulum. I could not see the whole pendulum, but only the arc that it described. Organic sensations with the pendulum. Suddenly 'back' coincided with one swing, and 'front' with the return swing. The visual part was six or eight feet off and below me.

G. I: we :: he: they. This was kinæsthetic. I put 'I' in the first line, 'we' in the fourth, he (he, she, it) in the third, and 'they' in the sixth. This was the declension in an old grammar. I did not see 'he, she, it,' but the line was long kinæsthetically, while 'I' and 'they' were dots.

Woodworth's fourth class, of cases in which the relation was present in consciousness but not analysable into sensory or affective terms,—the class upon which he bases his whole conclusion,—reduces, in our own experiments, to two equivocal instances.

G. Color: brightness :: tone: intensity. (G thought of intensity as an attribute.) Short period of confusion, which was muscular contraction. I repeated verbal stimulus and completed it almost automatically. Background filled with vague memories, in visual images and eye-movement, of experiments and discussions on brightness and intensity.

F. London: England :: Paris: France. I fell into the swing as soon as you started to read. It was familiar. This was a real change of muscular attitude, a sort of relaxation.

Woodworth's first class, in which the relation is not present in consciousness in any form, is abundantly illustrated.

G. Father: son :: mother: daughter. Purely verbal. The vaguest articulation of 'mother.' No relation about it.

G. Red: blue :: green: yellow. No relation. I was listening to the colors, and added the one you did not name, as I should have been ready to mention any one.

F. Is: are :: was: been. Verbal rhythm. I used to say 'is, are, was, been.' There was just the swing.

F. Boy: man :: girl: woman. Verbal. No image.

V. Is: are :: was: (am) were. Strong tendency to say 'am,' though I knew it wasn't right. This was kinæsthetic. When the stimulus was repeated, the 'r' in 'are' caused me to say 'were,' the two r's balanced. I did not think of the meaning till afterwards.

These seemed to be cases of mere association, in which the relation had no part. In order to test this conclusion, the method was slightly modified in two ways. Mingled with the

other stimuli were proportions made of pairs of familiar expressions, in which there was either no relation or one that could be recognised only with some ingenuity. The question implied was, whether these pairs would be replied to as promptly as the true relation pairs. Almost invariably this was the case. The other modification was the introduction of proportions in which the relation was reversed, that is, in which the third term really corresponded with the second and the fourth (to be supplied) with the first. In a few cases the observer refused to react; but this inhibition occurred only after such a proportion had already been given, and automatically reacted to. After the reaction, the observer sometimes saw that the order was wrong, and was therefore more careful the next time. In some instances, the change was never discovered at all. The following will illustrate the reactions to familiar phrases.

V. *Up: down :: out: in.* I responded immediately without reasoning, then wondered aloud why this was right. Felt tired.

G. *Loud: soft :: dark: light.* Almost reflexly. A little pause of hesitation during which I quickly went over the whole again in abbreviated form. No relation conscious.

F. *Live: die :: sink: swim.* Mere verbal association. When I stop to think, there is opposition, but this was not conscious. (F. can repeat the quotation from which this proportion is taken, but was not conscious of it when the reaction was made.)

Some of the wrong proportions were reacted to as follows:

F. *Father: mother :: aunt: uncle.* Quite verbal. I don't know whether the answer is right or not.

F. *Day: night :: winter: summer.* It is a muscular attitude which makes me answer. I was set for the rhythm, and reacted just as I should fill out an incomplete line of metre. The word came up of itself; winter and summer go together.

V. *Day: night :: winter: summer.* I said 'summer' because it seemed to belong there. I heard myself saying it before I said it. Later had a kinæsthetic feeling that it was backwards,—lack of balance and a feeling of twisting around.

A few experiments were performed, with the same observers, by means of little slips of colored paper. Three colors were given, and a fourth was to be added that would have the same relation to the third as the first to the second. The relations were not complicated by the introduction of different shapes and sizes. The method was not promising, and was soon discarded. When three of the four principal colors of the spectrum were given, the fourth was added without any 'feeling of relation.' It was simply the 'filling out of the series.' In the remaining cases, the relation was represented visually, verbally, or kinæsthetically.

The next series was intended to approach the problem of relation from a genetic standpoint. The purpose was to

establish some arbitrary relation, and to observe what took place in consciousness as it became more and more familiar.

The observer was told that

S is the cause of T
H " " " " K
L " " " " M

The proportions then combined three of the letters, in various ways, and the observer was asked to add the fourth term. The association was made by G originally from the written page. He was given the above statement to read and fix in mind. He disregarded the word 'cause' entirely, and remembered the letters as related merely by spatial arrangement, not visually, but by eye-movement. A movement of the eyes across and down must be followed by another in the same direction in order to make the relation correct. When the proportion $H:M::S:?$ was given, G reacted with K because this reply made two parallel diagonal lines. Although the proportions were too easy at the start to give the method a fair trial, the 76 experiments done with G show some effect of habit. At the beginning, the whole relation was carried by eye-movement; it was movements that were equated and that therefore represented the relation. Verbal ideas sometimes entered in. As early as the fourth experiment, $H:K::L:M$, G reports: 'I did not jump to L. I went down from K to M.' Abbreviation is beginning. From the twenty-eighth, the verbal reactions are numerous, though the eye-movement continues to some extent to the end. When $H:K::L:?$ was given, G simply went down the alphabet automatically.

In order to prevent this unforeseen possibility, different letters were given to F.

D is the cause of E
R " " " " L
T " " " " Q

The statement was read to him, in order that a merely spatial relation might not fix itself in the mind. Nevertheless, this result appeared, to a certain extent; the causal idea was entirely forgotten. Two letters of a pair were associated, and at first F did not distinguish the first from the second. If both numbers of one pair were given and only one of another, the missing term was immediately added. F also tended to read meanings into the letters. These methods of association made the reaction so easy that it was automatic, and conscious content was lacking from the first. F explained his reactions by saying that they 'just go together.' As the series offered no chance for improvement, it was abandoned after the nineteenth experiment.

The same letters were read to V. She visualised the top pair with 'cause' written between them, and the others below with ditto marks under the 'cause,' though she had not seen the paper. Sometimes the reactions were merely read off from this image. The fourth term was often supplied because it went with the third; there was no reference to what had come before. Only fifteen tests were given.

In all the experiments by this method, there is not a single case of a relation being consciously carried in non-sensory terms. Either it is definitely describable, or it is not conscious at all and the reaction is automatic. In the latter case it was usually immaterial to the observer whether the answer was right or not. Sometimes it was worked out carefully afterwards, and judged as to correctness; but in that event the relation was represented in some form of imagery.

As this method had proved too easy to exhibit the automatic reaction in process of development, another was devised. This time the stimuli belonged to three sense-orders, auditory, tactual and kinæsthetic. The observer sat with his right arm on a Sanford elbow-board, and the index-finger of his left hand on a small lever which moved up and down. The tactual stimuli, large and small pieces of sand-paper and of felt, were presented by being laid under the fingers of the right hand on the arm rest. A low and a high tuning-fork stood near by. The observer was told that the low tone was to be thought of as large, the high as small, while each one might be either strong or weak. The sand-paper was intended to represent strength or harshness, the felt weakness or softness; each might be either large and small. The arm movement was large, the finger movement small, while each might be either strong or weak. This arrangement was, no doubt, arbitrary, but it was arbitrary for a purpose. Easily perceived relationships had proved inadequate, and it was hoped that the artificiality of these new ones would make the reactions sufficiently difficult. Only G and V took part in this series of experiments.

G's reactions were at first almost without exception mediated by verbal expressions of the relation. He would say 'loud-soft' or 'strong-weak,' and the reaction followed. The verbal ideas were sometimes more complex than this, or the relation was partly kinæsthetic. It will give some idea of the progress of mechanisation if we fractionate the results. In the first 24 experiments there is not a single automatic reaction. The relations are carried in verbal terms. From the twenty-fifth to the forty-eighth there are 11 automatic reactions, in which the relation was not conscious. From the forty-ninth to the seventy-second there are 13, and from the seventy-third to the ninety-sixth, 17. The reactions are most often automatic when the three given stimuli are from the same sense department. There were only four possible variations in one sense department, and when three were given the fourth followed automatically. The series was carried so far, however, that even proportions between stimuli of different sense orders were sometimes reacted to automatically.

V made 40 experiments by this method but with no new result. The relation was usually verbal, once or twice kinæsthetic, and several times purely associative.

When we consider all of the relation experiments, we see that by far the larger part of the reactions were accompanied by some 'consciousness of relation' in terms of sensory or verbal images, and that the rest prove to be mere associations or else tendencies to fill out a group, by adding the inevitable fourth member, without any consciousness. Woodworth's fourth group is not paralleled in our experiments.

CONCLUSION

In conclusion, we may attempt to sum up the arguments which make against the simplicity of the 'conscious attitude'

and the existence of 'imageless' thought. These may be divided into the negative or critical, and the positive or those based upon our own experimental work. Under the former head the following may be noted:

(1) Having been named and negatively defined by Marbe, the *Bewusstseinslagen* are henceforth taken for granted. They are reported, along with sensation and image and feeling, in the analyses of complex states, and little or no attempt is made to analyse them.

(2) Nevertheless, they are, on several occasions, at least partly analysed, as witness Orth's account of doubt, Messer's and Watt's of trying to remember, and the discussions of the *Aufgabe*, which show it to be an attitude derived by practice from an analysable situation.

(3) The cases in which thought-elements or imageless thoughts or attitudes are reported as the 'consciousness that,' etc., are cases not of psychological description, but of the translation into words of the meaning of a conscious state (*Kundgabe*).

(4) Our own conclusions are based upon the introspections of seven observers, of whom all but one had had several years of psychological training. These observers were not all of one type, but ranged from the strongly visual to one who almost never has visual images, and from those who almost never report kinæsthetic sensations to those for whom these sensations and images are essential. These seven persons wrote, altogether, somewhat more than fourteen hundred introspections. In the series with point-letters alone, over four hundred cases of attitude are specifically reported,—aside from recognition, which is assumed to be present in all observations. Of these four hundred, about one fourth were merely named, while the remaining three fourths are more or less completely analysed. When the attitudes occur often enough to give a basis for generalisation, there is striking agreement between different observers and for the same observer at different times, and we are thus able to pick out, with a fair degree of assurance, the pattern of consciousness which represents a given situation. The introspections of any one observer show different stages of clearness and intensity of imagery, which allow us to connect, by a graded series of intermediate steps, a complex of vivid and explicit imagery with a vague and condensed consciousness which we suppose to represent what is called 'imageless' thought. The *Aufgabe*, recognition, and the feeling of relation are shown to be capable of development, by a process of change and mechanisation, from states which are obviously complex and imaginal.

It may, we think, be fairly said that the attitudes here analysed are typical of the whole class; they are certainly among those most often mentioned by writers on the subject. But, if part of the class can be reduced to simpler terms so often, so definitely, and so uniformly, there is every reason to believe that the rest will show themselves similarly complex, when they are subjected to the same analytical treatment. The general conclusion to be drawn from the sum of our results is that conscious attitudes can be analysed into sensations and images and feelings, or traced genetically to such analysable complexes, and therefore do not warrant the proposal of an additional conscious element.

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